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ABSTRACT

Classroom environment research investigating the relationship between classroom environment and self-handicapping was conducted in Australian, Canadian, and British high schools. A sample of 3,602 students from 29 schools responded to a questionnaire that assessed student perceptions of classroom environment, self-handicapping, and academic efficacy. Simple and multiple correlation analyses between 10 classroom environment dimensions and self-handicapping were conducted separately for 2 units of analysis (individual student and school grade group means) and separately with and without control for academic efficacy. Results showed that classroom environment accounted for appreciable proportions of variance in self-handicapping beyond that attributable to academic efficacy. Enhanced affective dimensions of the classroom environment were associated with reduced levels of self-handicapping. (Contains 24 references.) (Author)

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THE RELATIONSHIP BETWEEN HIGH SCHOOL MATHEMATICS CLASSROOM ENVIRONMENT AND STUDENT SELF-HANDICAPPING

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Abstract

Classroom environment research investigating the relationship between classroom environment and self-handicapping was conducted in Australian, Canadian and British high schools. A sample of 3,602 students from 29 schools responded to a questionnaire that assessed student perceptions of classroom environment, self-handicapping and academic efficacy. Simple and multiple correlation analyses between 10 classroom environment dimensions and self-handicapping were conducted separately for 2 units of analysis (individual student and school grade group means) and separately with and without control for academic efficacy. Results showed that classroom environment accounted for appreciable proportions of variance in self-handicapping beyond that attributable to academic efficacy. Enhanced affective dimensions of the classroom environment were associated with reduced levels of self-handicapping.

The strongest tradition of classroom environment research has focussed on empirically testing the relationship between classroom environment and student outcomes. This paper reports cross-national research conducted within this framework. Specifically, this research investigated the relationship between classroom environment and self-handicapping by students in Australian, Canadian and British high school mathematics classes. Before providing details of this research, a brief review of the fields of classroom environment and self-handicapping is provided.

Background

Classroom Environment

Research conducted over the past 30 years has shown the quality of the classroom environment in schools to be a significant determinant of student learning (Fraser, 1994, 1998a). That is, students learn better when they perceive the classroom environment positively. Numerous research studies have shown that student perceptions of the classroom environment account for appreciable amounts of variance in learning outcomes, often beyond that attributable to background student characteristics. For example, Goh and Fraser (1998) use the Questionnaire on Teacher Interaction (QTI: Wubbels & Levy, 1993) to establish associations between student outcomes and perceived patterns of teacher-student interaction in primary school mathematics classes in Singapore. Other studies have used classroom environment scales as dependent variables in investigating variations in environment across different settings. Studies reviewed by Fraser (1998b) have shown that classroom environment varies according to school type (i.e., coeducational, boys' and girls'), grade level and subject area. Some areas of contemporary classroom environment research include investigating special education classrooms in England (Adams, 2000), studying science classroom environment in Korea (Fisher & Huei-Baik, 1999) and defining differences between city and country students' perceptions of the learning environment (Waldrip & Fisher, 2000)

The learning environment field has developed rapidly with an array of validated instruments and research in at least twelve domains (e.g. evaluation of educational innovations, comparison of actual and preferred environments, and changes in

classroom environment during the transition from primary to secondary school) (Fraser, 1998b). Typically, empirical studies have employed these instruments or contextually modified derivatives to assess the particular environment under investigation. For example, the Catholic School Classroom Environment Questionnaire was developed specifically to assess the environment in Australian Catholic school classrooms (Dorman, 1999). The present study builds upon and extends this field of research by incorporating in the one study the latest learning environment instrumentation and recent developments in the study of self-handicapping.

Self-handicapping

Over the past few years, researchers have become interested in the study of academic self-handicapping by school students (Covington, 1992; Jagacinski, & Nicholls, 1990; Kolditz, & Arkin, 1982; Pyszczynski & Greenberg, 1983; Riggs, 1992; Urdan, Midgley, & Anderman, 1998). Self-handicapping is a form of proactive, avoidant behaviour which is designed to manipulate other people's perceptions of performance outcomes so that the student appears worthy to other people in the school. Importantly, self-handicapping strategies precede performance and influence performance. Examples of such self-handicapping strategies include putting off study until the last moment, fooling around the night before an examination and deliberately not trying in school.

Studies have shown that people who are both high and low in self-esteem use handicapping strategies but for different reasons (Midgley, Arunkumar, & Urdan, 1996; Tice, 1991). High self-esteem individuals use handicapping strategies to enhance their image by appearing to succeed despite minimal preparation. Low self-esteem individuals use handicapping to protect their image when there is a likelihood of poor performance. Recent research in the United States has found that lower achievers and students who have low self-perceptions of academic competence are more likely to engage in self-handicapping. According to Urdan, Midgley and Anderman, self-perceptions of competence may be a positive, significant predictor of self-handicapping even when performance outcomes are controlled. Compared to females, males are more likely to engage in self-handicapping.

The Present Research

Aims and Significance

The study had two aims:

- to validate scales that assesses classroom environment, self-handicapping strategies and academic efficacy adopted by high school students in Australia, Canada, and the United Kingdom, and
- to examine the relationship between students' perceptions of mathematics classroom environment and their use of self-handicapping

The research reported in this article was distinctive for four reasons. First, research on self-handicapping is a relatively new field and is an unresearched area in Australian secondary schools. Accordingly, the validation of a scale to assess self-handicapping in Australian secondary schools is important to the development of this field. Second, no studies have attempted to bring together the latest developments in the fields of self-handicapping research and psychosocial classroom environment research in secondary schools. Given that classroom environment has been shown to be a potent predictor of student cognitive and affective outcomes, the bringing together of these two fields is an important research direction. It could be hypothesised that classroom environment mediates the tendency of students to engage in academic self-handicapping activities. Third, because self-handicapping is a clear sign of purposeful disengagement from school related activities, the academic performance of students who self-handicap is likely to suffer. Accordingly, the present study focuses on an area of significant interest and concern for educators. Fourth, few classroom environment studies have involved mathematics classrooms and no previous studies have investigated the relationship between mathematics classroom environment and self-handicapping.

Sample

The identifiable sample employed in this study consisted of 3,602 students drawn from 9 Australian, 4 Canadian and 16 British high schools. Students from Grades 8,

10 and 12 participated in the study. Table 1 describes the sample. It should be noted that students were grouped according to grade level. Overall, the sample formed 76 school grade groups, 61 of which were coeducational. This grouping of students was important because subsequent analyses involved both the individual and these school grade groups as units of analysis.

Table 1 about here

Assessment of Classroom Environment

An important principle of the present study was to provide a comprehensive, parsimonious assessment of contemporary classroom environment. Significant recent work that attempts to bring parsimony to the field of learning environments by combining the most salient scales from existing questionnaires has produced an instrument called the What is Happening in this Class questionnaire (WIHIC: Fraser, 1998b). While the WIHIC is comprehensive, it is not designed to assess constructivist classroom environments. In a constructivist environment, meaningful learning is a cognitive process in which students make sense of the world in relation to the knowledge which they have constructed. The Constructivist Learning Environment Survey (CLES: Taylor, Fraser & Fisher, 1997) was developed to assist researchers to assess the constructivist dimensions of classrooms.

In the present study, seven scales from the WIHIC and three scales from the CLES provided a comprehensive assessment of classroom environment. From the original 56-item WIHIC, 42 items from its seven a priori scales were selected. From the CLES, 18 items from three scales were selected. Table 2 shows each of these six-item scales and their common sense descriptions. Each item used a 5-point response format (viz. Almost Never, Seldom, Sometimes, Often, Almost Always). Additionally, Table 2 shows the classification of each scale according to Moos's (1974) three general categories for conceptualising human environments (viz. Relationship, Personal Development, and System Maintenance and System Change).

Table 2 about here

Assessment of Self-handicapping

To assess self-handicapping, an Australian version of a 6-item scale developed by Urdan, Midgley and Anderman (1998) was developed for the study. Each of the six items in the Self-handicapping scale asks about an a priori strategy that students use to rationalise low performance. The response format for all items was a 9-point scale with anchors of 1 (not at all true) and 8 (very true).

Assessment of Academic Efficacy

Perceived academic efficacy refers to students' judgments of their ability to master the academic tasks that they are given in their classrooms. A 7-item scale using items developed by Midgley and Urdan (1995), Midgley et al. (1997), and Roeser, Midgley and Urdan (1996) was used to assess perceived academic competence at mathematics class work. Because the focus of the present research was mathematics classrooms and self-handicapping on mathematical tasks, each academic efficacy item was modified to elicit a response on academic efficacy at mathematics. As for the Self-handicapping scale, the response format for all Academic Efficacy items was a 9-point scale with anchors of 1 (not at all true) and 8 (very true).

Methods of Analysis

In the present study, associations between environment dimensions and self-handicapping were investigated using simple and multiple correlation analyses. As previous learning environment – outcomes research has attempted to control for background characteristics, academic efficacy in mathematics classroom was used as a covariate in some analyses. That is, separate simple and multiple correlation analyses between classroom environment and self-handicapping were conducted with and without statistical control for academic efficacy at mathematics tasks. Accordingly, the statistical techniques employed were simple correlation, partial correlation, multiple correlation and partial multiple correlation.

Another significant feature of the present analyses was the use of two units of analysis. Use of the individual as the unit of analysis may provide spurious results because an unjustifiably small estimate of the sampling error is employed in tests of significance. Additionally, students in grade groups are not statistically independent and the results of any subsequent test of significance could be questioned. Accordingly, separate analyses employing the individual and the grade group mean in each school as units of analysis were conducted.

Validation of Instruments

Classroom Environment

Scale Internal Consistency. Estimates of the internal consistency of the ten classroom environment scales were calculated using Cronbach's Coefficient alpha. Table 3 shows these values using the individual student and school grade group mean as units of statistical analysis. As expected, the values of Coefficient alpha based on school grade group means were somewhat larger than those obtained with the individual as the unit of analysis (Fraser, 1986). All scales had good internal consistency for both the individual and class mean as units of analysis.

Table 3 about here

Discriminant validity. Table 3 also reports data about the discriminant validity of the scales using the mean correlation of a scale with the remaining nine scales as an index. These data indicate that the scales do overlap but not to the extent that would violate the psychometric structure of the instrument. Additionally, the data compare favourably with discriminant validity data of other well-established classroom environment instruments (see Fraser, 1998b).

Ability to differentiate between classes. As shown in Table 3, one-way ANOVAs for each classroom environment scale with the student as the unit of analysis and school grade group membership as the main effect showed that each scale differentiated significantly between school grade groups ($p<.001$). The eta^2 statistic, which is a ratio of

"between" to "total" sums of squares (Cohen & Cohen, 1975), indicates that the proportion of variance explained by class membership ranged from 6% for the Involvement scale to 13% for the Personal Relevance scale.

Self-handicapping and Academic Efficacy

Using Cronbach's Coefficient alpha, estimates of the internal consistency of the six-item self-handicapping scale and seven-item academic efficacy scale were calculated. The values shown in Table 3 compare favourably with those reported by Midgley et al (1997) and Urdan, Midgley and Anderman (1998). As indicated in Table 3, one-way ANOVAs revealed that both the Self-handicapping and Academic Efficacy scales discriminated between school grade groups.

Results

The first type of analysis involved simple correlations and partial correlations (i.e. simple correlations adjusted for Academic Efficacy) between each classroom environment scale and the Self-handicapping scale. These analyses were performed separately for two units of analysis (individual and school grade group mean). The data in Table 4 reveal that 30 of the 40 simple and partial correlations were significant ($p<.001$) which is 750 times that expected by chance alone. It is noteworthy that all statistically significant correlations were negative. Higher scores on these classroom environment scales were associated with reduced levels of self-handicapping.

Each of the results in Table 4 can be interpreted in its own right. For example, higher levels of Involvement in the mathematics classroom were associated with lower levels of Self-handicapping, irrespective of whether Self-handicapping scores were adjusted for Academic Efficacy. When the school grade group was used as the unit of analysis, about 23% of variance in Self-handicapping scores could be attributed to Student Cohesiveness levels.

Table 4 about here

The second type of analysis consisted of a multiple correlation analysis and a partial multiple correlation analysis (i.e. a multiple correlation analysis with control for student Academic Efficacy) involving the set of 10 classroom environment scales as predictors of Self-handicapping and performed separately for the individual student and school grade group mean as units of analysis. Table 5 shows that that the multiple correlation coefficient (R) ranged from .33 for the partial multiple correlation analysis with the student as unit of analysis to .59 for the partial multiple correlation analysis with the school grade group mean as unit of analysis. The square of the partial multiple correlation coefficient is equal to the proportion of variance in Self-handicapping uniquely attributable to the ten classroom environment scales beyond that accounted for by Academic Efficacy. In the present analysis, this statistic was approximately 34%.

Table 5 about here

The standardised regression coefficients (β weights) can be used to interpret which individual classroom environment scales made the largest contribution to explained variance in Self-handicapping. From Table 5, it is clear that, with the individual student as the unit of analysis, Task Orientation was the strongest predictor in absolute terms. With the school grade group mean as unit of analysis, Personal Relevance was the strongest positive predictor of Self-handicapping. In total, 17 of the 40 β weights were significant ($p<.05$) which is approximately eight times that expected by chance).

Discussion

As no previous research on the relationship between classroom environment and self-handicapping has been conducted, it is not possible to discuss the results of this study in the light of previous research. Nevertheless, the results of this study suggest four important points. First, the pattern of significant findings is almost identical whether

the individual student or school grade group means was used as the unit of analysis, and whether or not Academic Competence was included as a control variable.

Second, a clear negative relationship exists between the seven What is Happening in this Class scales and Self-handicapping, irrespective of whether or not Academic Efficacy has been statistically controlled. These seven scales attempt to reflect conventional classrooms and are the culmination of three decades of instrument development in the classroom environment field. Clearly, more positive conventional classroom environments are associated with reduced levels of Self-handicapping.

Third, the results for the three Constructivist Learning Environment Survey scales are inconsistent. On the one hand, Student Negotiation has a negative relationship with Self-handicapping. On the other hand, Personal Relevance is positively related to Self-handicapping. Shared Control and Self-handicapping were correlated weakly. While the result for Student Negotiation is plausible, the result for Personal Relevance is not easily explained. It appears that students who perceive out-of-school relevance in their mathematics classes are more likely to Self-handicap. Further research involving identified constructivist learning environments and their relationship with Self-handicapping is warranted.

Fourth, the most striking result is the difference in direction of the relationship between Student Cohesiveness and Self-handicapping compared to that between Personal Relevance and Self-handicapping. This finding suggests that Self-handicapping is ameliorated through improved student – student relationships rather than by making mathematics more relevant to personal out-of-school issues. In a broad sense, the results suggest that Self-handicapping is enhanced by a positive informal curriculum but not by a formal curriculum that emphasises personal relevance.

Conclusion

The study reported in this paper extends prior classroom environment research in that it was the first study to investigate the relationship between classroom environment and self-handicapping with the cross-national sample employed in the study adding

support to the generalisability of findings. A by-product of this research has been the validation of 10 classroom environment scales in three Western countries. Additionally, Academic Efficacy and Self-handicapping scales developed by Midgley et al (1997) have been cross-validated. The use of two units of analysis and the employment of partial simple and multiple correlation analysis added to the distinctiveness of the study. Nevertheless, as causation cannot be implied from these correlational results, one cannot assume that classroom environment caused the reported levels of self-handicapping. A desirable direction of further research would the conduct of controlled intervention studies in which environment is deliberately manipulated and consequent levels of self-handicapping recorded.

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TABLE 1
DESCRIPTION OF IDENTIFIABLE SAMPLE BY COUNTRY, GENDER AND GRADE
(N = 3,602 students)

Year Level	Sample Size							
	Australia		Canada		United Kingdom		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
Grade 8	191	172	266	286	338	318	795	776
Grade 10	172	230	224	175	355	360	751	765
Grade 12	134	156	-	-	150	75	284	231
Total	497	558	490	461	843	753	1830	1772

TABLE 2
DESCRIPTIVE INFORMATION FOR 10 CLASSROOM ENVIRONMENT SCALES

Scale Name	Scale Description	Sample Item	Moos's Schema
Student Cohesiveness	The extent to which students know, help and are supportive of one another.	I know other students in this class. (+)	R
Teacher Support	The extent to which the teacher helps, befriends, trusts and is interested in students.	The teacher takes a personal interest in me. (+)	R
Involvement	The extent to which students have attentive interest, participate in discussions, do additional work and enjoy the class.	I explain my ideas to other students. (+)	R
Investigation	The extent to which skills and processes of inquiry and their use in problem solving and investigation are emphasised.	I carry out investigations to test my ideas. (+)	P
Task Orientation	The extent to which it is important to complete activities planned and to stay on the subject matter.	I pay attention in this class. (+)	P
Cooperation	The extent to which students cooperate rather than compete with one another on learning tasks.	I work with other students in this class. (+)	P
Equity	The extent to which students are treated equally by the teacher.	I am treated the same as other students in this class (+)	S
Personal Relevance	The extent to which school mathematics connects with students' out-of-school experiences.	I learn how mathematics can be part of my out-of school life. (+)	R
Shared Control	The extent to which students are invited to share with the teacher control of the learning environment.	I help the teacher to decide which activities are best for me. (+)	P
Student Negotiation	The extent to which opportunities exist for students to explain and justify to other students their newly developing ideas.	I talk to other students about how to solve problems. (+)	S

Note. R: Relationship P: Personal Development S: System Maintenance and System Change

TABLE 3

VALIDATION DATA AND SCALE STATISTICS FOR CLASSROOM ENVIRONMENT, ACADEMIC EFFICACY AND ACADEMIC SELF-HANDICAPPING SCALES FOR TWO UNITS OF ANALYSIS

(N = 3,602 students in 76 school grade groups)

	Alpha Reliability		Mean Correlation		ANOVA Results		Scale Statistics[a]	
Scale	Student	School Year Group Mean	Student	School Year Group Mean	F (75, 3527)	Eta^2	Mean	Standard Deviation
Student Cohesiveness	.83	.93	.32	.34	3.9*	.09	25.56	1.48
Teacher Support	.84	.93	.42	.38	5.3*	.12	19.68	1.93
Involvement	.79	.81	.45	.41	2.3*	.06	19.41	1.17
Investigation	.85	.90	.40	.27	3.1*	.08	16.68	1.39
Task Orientation	.82	.83	.35	.28	2.9*	.07	24.23	1.20
Cooperation	.76	.86	.42	.46	3.4*	.08	21.62	1.57
Equity	.84	.93	.38	.35	3.8*	.09	23.57	1.52
Personal Relevance	.76	.89	.30	.21	5.4*	.13	17.72	1.77
Shared Control	.88	.93	.32	.28	3.0*	.07	13.42	1.51
Student Negotiation	.80	.85	.41	.45	2.9*	.07	19.57	1.43
Academic Efficacy	.86	.92	-	-	3.2*	.08	36.57	3.14
Self-handicapping	.85	.90	-	-	2.9*	.07	13.42	2.95

* $p < .001$

[a] Scale statistics are based on school grade group means.

TABLE 4

SIMPLE AND PARTIAL CORRELATIONS FOR TEN CLASSROOM ENVIRONMENT SCALES AND SELF-HANDICAPPING FOR TWO UNITS OF ANALYSIS

(N = 3,602 students in 76 school grade groups)

Classroom Environment Scale	Self-handicapping			
	Simple Correlation		Partial Correlation	
	Student	School Grade Group	Student	School Grade Group
Student Cohesiveness	-.12***	-.48***	-.10***	-.48***
Teacher Support	-.17***	-.28***	-.13***	-.25***
Involvement	-.16***	-.38***	-.06**	-.37***
Investigation	-.14***	-.09	-.07**	-.06
Task Orientation	-.37***	-.32***	-.30***	-.29***
Cooperation	-.16***	-.42***	-.11***	-.40***
Equity	-.25***	-.35***	-.19***	-.33***
Personal Relevance	-.01	.12	.03	.15*
Shared Control	.03	.05	.04*	.04
Student Negotiation	-.13***	-.37***	-.09***	-.35***

*p<.05 **p<.01 ***p<.001

TABLE 5

MULTIPLE AND PARTIAL MULTIPLE CORRELATIONS FOR TEN CLASSROOM ENVIRONMENT SCALES AND SELF-HANDICAPPING FOR TWO UNITS OF ANALYSIS

(N = 3,602 students in 76 school grade groups)

	Self-Handicapping			
	Multiple Correlation Standardised Regression Coefficients (β)		Partial Multiple Correlation Standardised Regression Coefficients (β)	
Classroom Environment Scale	Student (R = .40)	School Grade Group (R = .58)	Student (R = .33)	School Grade Group (R = .59)
Student Cohesiveness	.05*	-.12	.04	-0.20*
Teacher Support	-.06*	.03	-.07**	.06
Involvement	.01	-.16	.06*	-.19
Investigation	-.02	.18	.03	.14
Task Orientation	-.35***	-.12	-.29***	-.03
Cooperation	-.01	-.13	-.03	-.17
Equity	-.08**	-.14	-.08**	-.14
Personal Relevance	.09***	.21*	.10***	.26**
Shared Control	.10***	-.05	.09***	-.03
Student Negotiation	-.06*	-.22*	-.05	-.10

*p<.05 ** p<.01 ***p<.001